



# Spectral Gamma-Ray Borehole Log Data Report

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Borehole

# 21-04-06

Log Event A

## Borehole Information

Farm : <u>BX</u>	Tank : <u>BX-104</u>	Site Number : <u>299-E33-224</u>
N-Coord : <u>45,350</u>	W-Coord : <u>53,350</u>	TOC Elevation : <u>660.00</u>
Water Level, ft :	Date Drilled : <u>10/31/1973</u>	

## Casing Record

Type : <u>Steel-welded</u>	Thickness : <u>0.280</u>	ID, in. : <u>6</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>102</u>	

## Borehole Notes:

Borehole 21-04-06 was drilled in October 1973 to a depth of 100 ft with 6-in. casing. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel tubing. A drilling log was not available for this borehole, so data from Chamness and Merz (1993) were used to provide construction information. Although no information concerning grouting or perforations was available, it is assumed that the borehole was not grouted or perforated since this was not a routine practice during the 1970s drilling campaign. The top of the casing, which is the zero reference for the SGLS, is approximately 4 ft above the ground surface. The available survey data do not account for the 4 ft of casing that extends above the ground surface; the top of casing elevation was adjusted to accommodate this feature.

## Equipment Information

Logging System : <u>1B</u>	Detector Type : <u>HPGe</u>	Detector Efficiency: <u>35.0 %</u>
Calibration Date : <u>02/1997</u>	Calibration Reference : <u>GJO-HAN-13</u>	Logging Procedure : <u>P-GJPO-1783</u>

## Log Run Information

Log Run Number : <u>1</u>	Log Run Date : <u>05/22/1997</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>0.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>41.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

Log Run Number : <u>2</u>	Log Run Date : <u>05/23/1997</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>101.5</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>40.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

Log Run Number : <u>3</u>	Log Run Date : <u>05/23/1997</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>25.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>10.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>



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## Analysis Information

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Analyst : E. Larsen

Data Processing Reference : MAC-VZCP 1.7.9

Analysis Date : 10/24/1997

### Analysis Notes :

This borehole was logged by the SGLS in three log runs. Two log runs were required to log the length of the borehole. A third log run was performed as an additional quality assurance check on a segment of one of the primary log runs. The pre- and post-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from these spectra were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

The man-made radionuclides Cs-137 and Eu-154 were detected in this borehole. The Cs-137 contamination was detected continuously from the ground surface to 38.5 ft. A thin zone of Eu-154 contamination was detected from 2.5 to 3 ft.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

The K-40 concentration values increase sharply from 42 to 45 ft and remain elevated to the bottom of the logged interval. The majority of the U-238 concentration values are absent between 0.5 and 16 ft.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank BX-104.

### Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations.

Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

The interval between 10 and 25 ft was relogged as a quality assurance measure to establish the repeatability of the radionuclide concentration measurements. The radionuclide concentrations shown were calculated using the separate data sets provided by the original and rerun logging runs.



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Plots of the spectrum shape factors are included. The plots are used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.